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ABSTRACT

This syllabus describes a course designed for the student interested in teaching mathematics at the secondary level and includes both campus centered activities and a field experience. The professor teaching this class is expected to "bridge the gap" between theory in the college classroom and practice as viewed in the secondary school. The document provides a brief introduction to the course, and provides information on: (1) credit hours; (2) time and sequence; (3) course content (63 topics); (4) evaluation (six elements); (5) sample objectives for selected course content topics; and (6) a bibliography. (MP)

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GLASSBORO STATE COLLEGE
GLASSBORO, NEW JERSEY

Department of Curriculum and Instruction: Secondary

Syllabus

Methods and Materials in Teaching Secondary School Mathematics

0833.321

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Revised 1981

SE 035 423

Introduction

Methods and Materials of Teaching Secondary School Mathematics is a course designed for the student interested in teaching mathematics in a secondary school including middle school, junior high school, and senior high school. The course includes campus centered activities such as, formal class meetings, lectures and discussions, demonstrations of teaching techniques involving the use of audio and visual materials, discussions of philosophy, objectives of various types of mathematics teaching, analysis of psychological knowledge pertaining to human learning and human behavior and many others. This class meets for 2½ hours for 16 weeks.

Part II consists of a "Field Experience". Each student is assigned to a secondary classroom teacher of mathematics for this laboratory experience. The student functions as a teaching assistant carrying out many kinds of activities including tutoring students who need it, working with groups, preparing teaching materials of all kinds, marking papers, etc. While the college students are not expected to teach full classes as is required in "Student Teaching", some formal teaching may be permitted in the latter stages of the semester.

Each student is expected to spend a minimum of four clock hours per week during the semester in this field experience.

The professor teaching this course attempts to "bridge the gap" between theory in the college classroom and what takes place in the secondary school classroom. Theory is related to practice. Techniques of teaching are analyzed and evaluated. Psychological constructs are discussed in terms of adolescent behavior, both positive and negative, that are observed in the classroom. Understanding is stressed so that emphasis can be placed upon helping children improve themselves in their learning, behavior, and attitudes. Special attention is given to the problems of the handicapped child and developing learning environment for this child.

Credit Hours

Methods/Materials in Secondary School Mathematics . . . . . 4 S.H.

Time and Sequence

The mathematics methods course is a required course and a prerequisite for the "Professional Semester of Mathematics Teaching" (Senior year Practicum/Student Teaching). Most students choose to take this course during the junior year.

Course Content

In general, this course attempts to help the college student integrate (within his own mind) what he has learned in mathematical content, theories of learning (e.g. transfer of training), leading and teaching children who have many kinds of problems, motivating students of all types, using audio and visual aids, and developing a wholesome professional attitude.

Specifically, the following topics are presented via lectures, discussions, reports, demonstrations, readings, etc.

1. Construction of detailed daily lesson plans and developing Individualized Educational Program (IEP) for the handicapped child.

2. Construction of a "teaching unit" approximately three weeks in length.

3. Individualizing instruction for all students.

4. Use of games to add interest in the classroom.

5. Developing motivational techniques for the math classroom.

6. Correlation of mathematics with science, social studies, art, etc.

7. Learning to teach by observing other teachers, recording these observations, analyzing these observations, and drawing valid conclusions about techniques of teaching.

8. The art of questioning. How good questions help the learning-teaching process.

9. Guiding principles of developing and maintaining good discipline (control) in the classroom.

10. Effective utilization and operation of audio and visual aids.

11. Writing effective instructional objectives for classroom use.

12. Identifying and assisting children with visual or hearing impairments.

13. Teacher made tests.

14. Evaluation of students work using devices other than tests.

15. Teaching for an understanding of the history of mathematics.

16. Deductive and inductive teaching.

17. Problem solving activities for the slow learner and learning disabled student.

18. Kinds of assistance available to teachers:

    a) Educational Improvement Center (E.I.C.), Hurffville, New Jersey, Gloucester County - A State Department of Education sponsored service.

    b) Southern New Jersey Regional Teacher Center established to assist teachers who have identified their own professional development needs.

19. Sources of educational information:

    a) textbooks
    b) periodicals
    c) E.I.C. (above)
    d) teacher centers (above)

20. Professional organizations, journals, and conventions including National Council of Teachers of Mathematics.

21. Designing a mathematics laboratory physically accessible to all students.

22. The cascade system of mainstreaming.

23. Declining achievement scores in science and mathematics.

24. The impact of television on learning and growing up.

25. The development of logical thinking and the emergence of the concept of numbers, seriation, sets, proportion, etc.

26. Mathematics language.

27. Women, minorities and the handicapped among professionals in mathematics.

28. Overcoming math anxiety, "math phobia", etc.

29. Teaching mathematics to students from non-English speaking sub-cultures.

30. Contributions of mathematicians of various cultural origins.

31. Helping students understand and accept their handicapped classmates and teachers.

32. Sex differences in mathematical interest and their implications for technological and engineering work force.

33. Choosing a teaching position.

34. Optical media for teaching math to the visually impaired, i.e., overhead demonstration calculators.

35. Convergent and divergent thinking styles and problem solving ability.

36. Mathematical avoidance syndrome, Fennema-Sherman Scale.

37. Fundamental concepts that run through all branches of mathematics: set, function, binary operation, field, factor, group, algorithim, deduction, etc.

38. The subject components of the secondary mathematics curriculum, i.e., Algebra, Geometry, Trigonometry, General Math, Business Math, Consumer Math, etc.

39. 1955-1975 "The New Math Period" and its influence on the curriculum.

40. Psychological controversies of teaching mathematics, i.e., Bruner, Piaget, Gagne, Bloom.

41. Thinking Metric.

42. Improving basic skills at all levels of mathematics teaching.

43. Process by observing, analyzing, and improving basic skills of students by:

    a) analyzing test scores and specific items.
    b) directed analysis during tutoring process.
    c) teaching for specifically identified skills.
    d) providing suitable practice.

44. What is the Mastery Learning Approach?

45. The classroom teacher and specific laws that affect him/her, i.e., Public Law 94:142, The Education for All Handicapped Children Act of 1975.

46. Giving assignments that assist in the learning process.

47. Designing mathematics programs for the gifted student.

48. How to evaluate one's self realistically in the teaching process.

49. The need for safety in the classroom.

50. Assessment of progress in basic skills.

51. Use of programmed learning materials in the math classroom.

52. Mathematics careers for the handicapped.

53. Use of computers to teach basic skills and advanced skills.

54. Electronic calculators in secondary school classrooms.

55. Encouraging development from concrete to abstract reasoning.

56. Developing a personal educational philosophy of education.

57. The use and misuse of mathematical symbolism.

58. Parent-teacher relationships.

59. Sources of free and inexpensive materials.

60. The "EGG 12" Computer.

61. Mathematics and the Active Learning Approach.

62. Mathematics Curriculum Projects: SMSG (School Mathematics Study Group) CSMP (Comprehensive School Mathematics Project) UMMAP (University Maryland Mathematics Project) SSMCIS (Sec. School Mathematics)Curriculum Improvement Study)

63. Values and mathematics education.

EVALUATION

The evaluation process will be used to help make this course worthy of being a prerequisite course to "Student Teaching". It will include:

A. Evaluation by instructor, college student and field experience coordinator along with his school principal.

B. Evaluation of student by instructor using: 1) Examinations, 2) Classroom participation in discussion, 3) Presenting timely, oral reports of readings, 4) Teacning of a mini-lesson to student peers.

C. Instructor evaluation by students.

D. Evaluation of student by field experience classroom teacher.

E. Student self-evaluation.

F. Instructor self-evaluation.

Specific Objectives

A. Sample objectives for course content topics. All of the topics listed in the content section of this syllabus can be written in behavioral objective form. For example, the student will be able to:

1) write a detailed daily lesson plan.

2) write clear specific cognitive objectives.

3) write clear skills objectives.

4) write clear objectives in the affective domain.

5) write a teaching unit for a specified period of time in an identified subject matter content area.

6) analyze a secondary school student's ability in computational mathematics, identify where difficulties are being encountered, and plan specific steps to teach the skills that are needed.

B. Sample objectives involving educational media. The student will be able to:

1) operate an 8 mm film loop projector.

2) design and construct bulletin board displays for specific purposes.

3) operate a "reel-to-reel" sound tape recorder.

4) operate a cassette recorder.

5) prepare overhead transparencies and use the overhead projector.

6) prepare mimeograph stencils and operate machine.

7) demonstrate effective chalkboard techniques.

8) prepare spirit masters and use duplicating machine.

9) identify sources of free and inexpensive teaching materials.

10) List several ways in which commercial and public television can act as a teaching tool.

11) Identify ways in which 3-dimensional "tactile" models may be used in teaching math to the visually impaired.

12) Design diagrams, charts, pictures, etc. to supplement instruction for the auditory handicapped.

C. Sample objectives concerning instructional foundations.

The student will be able to:

1) Evaluate six different teaching strategies and execute each in a classroom environment.

2) Respond to a number of simulated classroom dilemmas involving interpersonal relationships.

3) Write clearly stated instructional objectives.

4) Identify and apply a technique for textbook evaluation.

5) Distinguish between "product" and "process" teaching.

6) Prepare an inquiry instructional sequence.

7) Describe acceptable homework strategies.

8) Identify the essential components and the science teachers responsibility in the cooperative design of IEPs.

9) Describe special programs, strategies and problems in teaching the gifted and talented student.

10) Prepare a unit (or some term of long-term plan) that integrates competency in subject matter with understanding of how children learn and creative instructional strategies.

11) Give a list of affective implications of math teaching.

12) Explain the theories and their implications for math education of the following: A) Jerome Bruner, B) Robert Gagne, C) Jean Piaget, D) Lawrence Kohlberg, and E) John Dewey

13) Prepare evaluation activities which reflect stated objectives.

14) Describe acceptable practices concerning testing and grading.

15) Work cooperatively and productively in team planning.

16) Join a professional organization for math teachers.

17) Identify students with hearing or visual impairments.

18) Design a barrier free math laboratory.

19) Develop or redesign math curriculum materials for students who have visual or hearing impairments, learning disabilities, orthopedic handicaps, etc.

20) Integrate math career opportunities into curriculum planning.

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